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Carcinoma of the Large Bowel

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CARCINOMA of the large bowel is a serious problem. In the year 1935 in Ulster alone, with a population of 1,287,000, there were over 1,600 deaths from cancer, and of this number some seventeen to twenty per cent. belonged to the large bowel. The figures should probably be higher. Cases are certified as carcinoma of the stomach, intestinal obstruction, cardiac failure, etc., which are in reality carcinoma of the large gut.

SEX.

It is interesting that the figures show that males are more prone to the disease than females, by about 2.4 to 1. The explanation is unknown. Whether carcinoma in one part, as in the breast or uterus, prevents carcinoma developing in other parts by producing a type of immunity, is hard to prove.

SITES OF GROWTH.

The disease has a predilection for certain sites. One would expect that the areas of delay, the cæcum, the pelvic colon, and the rectum, would be most liable to harmful influences. The contents on the left side are solid and more likely to injure the delicate mucosa. Also the left side is not primarily adapted to storage and is probably more readily injured. The part of the cæcal wall opposite the ileo-cæcal orifice is the usual spot where a carcinoma of the cæcum starts. This is the spot most in danger of injury. Wakeley suggests that the alkaline contents of the cæcum abutting on this spot may be a causative factor.

Site of Growth in the Colon.

	J. Hopkins H. per cent.	R.V. Hosp. per cent.
Cæcum and ascending colon	35.3	24.0
Hepatic flexure	9.5	4.6
Transverse colon and splenic flexure ...	13.1	13.7
Descending colon and sigmoid	37.4	57.4
Site unknown	4.7	—

Rectum 6, Colon 4.

Pathology.

The growth starts as a proliferation of the normal mucous membrane, forming excrescences of the size of a pinhead to the size of a pea, or larger. The connective tissue at the base may also proliferate, forming a stalk, and the little tumour is pedunculated; or the tissue may not proliferate at the rate of the surface epithelial cells, and the growth is now a flat sessile tumour. A mucus is secreted by these epithelial cells, which tends to irritate them. Later a cell on the surface takes on a malignant change, and it gradually eats through, transforming the whole tumour into a malignant tumour. If there have been several adenomata, as is frequent, the others remain stationary or retrogress when one takes on a malignant change. The malignant tumour now spreads in the line of least resistance, it spreads more under the mucous membrane than on its surface, and tends to encircle the bowel. Miles reckons that it takes two years to encircle the gut. As it spreads, so it penetrates. It gradually works through the muscular coat. Up to now there has been no glandular invasion and the disease is strictly a local one. When it has penetrated the muscular coat, glandular metastases occur, and the disease is now free to spread without control. In a few cases, circulatory embolism occurs, but the percentage of cases of this mode of spread is negligible.

Dukes makes the following practical classification :—

Type A—confined to mucous membrane.

Type B—infiltrated the muscular coats, but not penetrated.

Type C—penetrated through the muscular coats.

As the tumour grows, the blood-supply of its central area becomes poorer, and it eventually necroses, forming the crateriform ulcer; there is also a tissue reaction at its base with the formation of fibrous tissue. This reaction varies in intensity, but occurs in all penetrating carcinoma. In the bowel this fibrosis leads to stricture formation. Different types of carcinomata are different stages in the same process. By the time a stricture is produced, the growth has penetrated the muscular coats, so that when obstruction arises the tumour is in the B or C stage.

Of one hundred growths examined at St. Mark's Hospital (Gabriel) :—

Stage A	1
Stage B	24
Stage C	75

Yet it takes months for the growth to pass from the A stage to the B stage.

When the growth has penetrated the muscular coats and affected the glands, it may invade the neighbouring structures. Growths in the hepatic and splenic flexures invade the perirenal fat, and where the colon has no mesentery, as in the ascending and descending colon, the muscles and skeletal structures are rapidly involved and secondary growths in the liver are common.

The hyperplasia of mucous membrane may not necessarily be the beginning of malignancy. The raspberry tumour of the rectum in children is a case in point. We have no evidence to suggest that these children develop carcinoma of the bowel. A villous hyperplasia also occurs in colitis and inflammatory conditions. But apart from these inflammatory conditions, this proliferation occurring in adults must be viewed with misgiving.

Numerous islets of proliferated mucous membrane may be scattered over the colon. Malignant change eventually occurs in one, and the neighbouring masses cease to grow. If this malignant area is removed, one of the other islet masses further up the bowel will in time begin to show malignant changes, and the patient will have a recurrence of the disease. In one set of patients the condition of polyposis is not hereditary and the patient has a chance, though small, of escaping carcinoma. But in another set the condition is hereditary (Polyposis Congenita), and malignancy is certain. The taint is handed down according to Mendelian Law. These patients with their inherent tendency do not show any sign of abnormal mucous membrane of the colon till after puberty. Then the condition may appear at any time. Lockart Mummery examined a patient with this tendency at the age of 39, and found the bowel normal, yet four years later the patient had the whole mucous membrane of the colon studded over with these potentially malignant growths. One might well ask what kept this malign influence at bay or what happened that made it declare itself? The answer of this question might settle the cancer problem.

Malignant growths in the colon are of relatively low malignancy. They are slow in invading the glands, and metastases in the liver are not common.

METASTASES (RAIFORD).

CÆCUM AND ASCENDING COLON.

Location	Number of Cases	Per Cent.
Lymph nodes	27 (Wk y. 32%)	40.4
Liver	1	1.5
Other sites	8	11.9
HEPATIC FLEXURE.		
Lymph nodes	8	44.4
Liver	1	5.5
Other sites	3	16.6
TRANSVERSE COLON.		
Lymph nodes	4	28.6
Liver	1	7.1
Other sites	0	0

DESCENDING AND PELVIC COLON.

Lymph nodes	14	19.4
Liver	5	6.9
Other sites	7	9.7

The right side of the colon is more plentifully supplied with glands than the left, and so glandular involvement is more common on the right side.

Even when a growth has existed for a long period and invaded its surroundings, if these are amenable to resection, a cure is not unlikely. An adenoma of the rectum should be looked on as essentially malignant, and a removal with its surroundings, including glands, undertaken. Gordon Watson says in regard to adenomata: "Malignant growth is the final aim of a mucosa which has acquired through hereditary tendency the desire to run riot." Lockart Mummery reports a case in which he removed an adenoma from the rectum. This on microscopical examination was reported as a simple adenoma. Twelve months later it recurred. It was again removed. This time the pathologist reported some evidence of malignancy. Eighteen months later an induration was felt in the surroundings, and the area and rectum removed by an abdominal perineal resection. Sections of the indurated area showed it to be invaded with malignant cells.

In considering the symptoms of this dreaded disease, we must constantly bear in mind the pathological lesion and its possible anatomical surroundings.

First—a vascular bud.

Second—an ulcerating tumour.

Third—an ulcerating tumour and fibrous constriction.

If the lesion occurs in a loose sac like the cæcum, it will tend to proliferate into the lumen as the line of least resistance, likewise in the ampulla of the rectum (fig. 1). In a narrowed area like the descending colon or the recto-sigmoidal junction, the tumour is subject to pressure; it ulcerates more rapidly and causes more constriction (fig. 2).

CLINICAL FEATURES.

Carcinomata of the large bowel is a disease of late middle life. The majority of our patients are between fifty and sixty years of age. One was under twenty years old, five were under thirty years, and one of the patients in the series examined was ninety years old.

One can say little of predisposing causes, except in the case of polyposis congenita already mentioned. Lane blamed habitual constipation; yet hospital figures do nothing to confirm this; and women, who are less prone to carcinoma of the colon, are more prone to habitual constipation.

Now, symptoms are the fruit of a disturbance in normal function. So to detect the earliest symptoms relating to an organ, one must be conversant with its normal function.

FUNCTIONING OF NORMAL COLON.

In the case of the large bowel it is necessary to realise that it is composed of separate sections, each with its proper function. The digestive tract is composed

of a series of collecting chambers with tubes conducting to and from them. Each chamber has its specialised mechanism of filling and emptying. The best understood is the stomach. The cæcum is a type of filling chamber or stomach. Its cardia is the ileo-cæcal opening, its pyloric antrum is the ascending colon and hepatic flexure; its pylorus is at an area about three inches across the transverse colon, which will be referred to as the "hepatic point." As the cæcum fills, its walls relax and its sphincter at the hepatic point contracts; when the cæcum becomes packed full, the stimuli on its walls cause them to contract and the hepatic point to relax. In this chamber or cæcum, the contents are in a semi-fluid state, subject to bacterial digestion and to the active absorption of the products of bacterial digestion.

From this first collecting chamber in the colon the contents are passed on through a kind of conducting tube or gullet. In this tube or "colonic gullet," which comprises the transverse colon, splenic flexure, and descending colon, the contents are squeezed, dried, and pounded, so that they are almost solid. Then on a stimulus as yet unknown, the hepatic point contracts, the colonic gullet relaxes its pounding, and the contents are rushed down into the pelvic colon. This left collecting chamber of the colon (pelvic colon) has only been secondarily adapted for storing, and is never much other than a modified part of the colonic gullet. Its stimuli are to a great extent dependent upon the stimuli acting on the cæcum. The rectum, on the other hand, is more specialised with its pelvi-rectal sphincteric arrangement, its dilated chamber or ampulla, and its sphincteric outlet, the anal canal.

Malignant Growths in the Cæcum.

Malignant growths in the cæcum start in the mucous membrane opposite the ileo-cæcal opening, and tend to spread down to the caput cæci and round towards the ileo-cæcal opening. It is only late in their history that they encroach on this opening and obstruct it. On account of the site of the growth at the beginning and the semi-solid contents of the cæcum, obstruction is a late event in these growths, and hope of cure is then small. The earliest sign must be first—interference with function, i.e., interference with filling and absorption. This shows itself first by the passage of its contents more rapidly than normal, or in other words more frequent motions. At first the patient only thinks that his bowels are more regular, if he is inclined to constipation; or if regular before, he does not notice the unusual laxness. The interference and changes in the function of absorption at first produce little effect, but later as the growth gets larger and pours out its excess mucus and becomes ulcerated, the patient absorbs these toxins and acquires a secondary anæmia. This secondary anæmia may be hastened by the loss of blood from the ulcerated tumour. In seventeen cases of carcinoma of cæcum, blood was noted by the patient in one case. In Wakeley's series of thirty-one cases, it occurred three times. In fact, many patients consult their medical adviser for their anæmia, and do not mention any abnormality in their bowels. In an unexplained case of secondary anæmia the abdomen should be examined for a growth in the colon.

AVERAGE HÆMOGLOBIN (RAIFORD).

Site	Per Cent.	Number of Cases
Cæcum and ascending colon	64.8	36
Transverse colon and flexures	71.4	27
Descending colon and sigmoid	75.5	46

As the walls of the cæcum become more infiltrated, the expulsive powers of the cæcum become less, the ileo-cæcal opening becomes encroached upon, and ileo-stasis is the rule. This shows itself by flatulent indigestion coming on after meals, fullness in the lower abdomen, and windy pains. Finally the ileo-cæcal opening is invaded, and terminal acute obstruction has set in.

CARCINOMA OF THE CÆCUM (R.V. HOSPITAL).

From 1928 till 1937 there were twenty-seven cases of carcinoma cæci. Of these, resection was attempted in thirteen, palliative treatment in fourteen, i.e., roughly fifty per cent. were beyond any surgical attempt to cure.

Of the thirteen resected, five died as the result of the operation = 38.5 per cent.

This leaves eight who survived with hope of cure. All three who were operated upon over five years ago are still alive. The other five have been too recently operated upon to estimate a cure.

PRESENCE OF PALPABLE TUMOUR.

Fortunately, the cæcum is situated in an area that is easily and convincingly palpable. In a series of seventeen cases of carcinoma of the cæcum, a tumour was noted as palpable in fifteen. Possibly under an anæsthetic a tumour might have been palpated in the other two cases.

The tumour in carcinoma of the cæcum is mobile until late in the disease. It may be slightly tender. It is well localised.

Tubercle is more fixed and tends to spread up the ascending colon. An appendical abscess is also fixed and there are more signs of an acute inflammatory condition.

A rise in temperature is not uncommon in an ulcerated growth of the colon. Wakeley found a leucocytosis in fifty per cent. of his cases of carcinoma of the cæcum.

SUMMARY OF SYMPTOMS.

To sum up, one should put down the early symptoms of carcinoma of the cæcum as, first, the passage of more frequent motions, followed by a period of constipation associated with flatulent indigestion, eased by purgatives. Later, in the obstructed stage, purgatives produce pain. Occasionally secondary anæmia, and on occasions blood in the stools. X-ray examination after a Ba. enema will show a filling defect in the cæcum; if this is doubtful, a barium meal should be given. Finally a palpable lump is felt in the right iliac fossa. In doubtful cases the patient should be palapted under an anæsthetic.

ASCENDING COLON AND HEPATIC FLEXURE.

In the ascending colon and hepatic flexure the symptoms are essentially those of an obstructing tumour. Here, on account of the semi-fluid contents, obstruction

is slower than on the left side of the colon, but on account of its relation to the cæcum and ileo-cæcal area, ileo-stasis and reflex dyspepsia are relatively early.

Pain may also be localised on account of the absence of a mesentery, for any attempt at distension pulls on the local parietal peritoneum.

If the growth should begin near "the hepatic point," indigestion is earlier than in any other site in the colon. The growth probably causes spasm and interferes with the emptying of the cæcal chamber, producing early ileo-stasis and its symptom, flatulent indigestion.

A patient previously well begins to complain of flatulent indigestion. He notices his bowels are inclined to be constipated. He thinks his liver is out of order and he takes a purge. This empties his cæcum, and he is cured of his symptoms for several days till the cæcum fills up again. Then his indigestion returns, and he flies to his bottle of "liver salts" or other pet remedy. He is again relieved for several days. He accustoms himself to taking salines regularly, and the warning symptoms are driven off. Later he finds he has to increase his doses, and the laxatives begin to give him griping pains. He feels discomfort in the hypochondrium. He is full of wind, and he goes to his medical adviser.

The history of indigestion, which occurs after meals, and the pain in the hypochondrium may suggest to the doctor a gastric or duodenal ulcer, and the patient is subjected to an ulcer regime. The small meals and the laxatives prescribed may appear to help the patient for a time, but inevitably the symptoms get worse, and he returns, or visits another physician. This time the flatulence, the tenderness in the hpyochondrium, and the relief originally afforded by salines, suggest a gall-bladder lesion. He is now treated for his supposed gall-stones and cholecystitis.

Many patients with carcinoma of the colon go about for months with an unexplained indigestion, until an attack of acute intestinal obstruction shows the origin of their trouble.

It is interesting, on looking over the hospital records, to note how many of these patients have come to hospital for their indigestion, and have had a barium-meal examination of their stomach, and their gall-bladder investigated, before the lesion in their colon was finally run to earth.

From Simple Notes on a Case Sheet.

J. D. complained of indigestion on and off for three or four years. The pain was made worse by food, and he thought it was relieved by powders. He did not vomit, but he felt sick and suffered much from flatulence. For the last three weeks he had got a severe pain in his stomach immediately after meals.

At operation he had a growth at the "hepatic point." This was considered inoperable, and the area was short-circuited. He died in hospital four weeks later.

Transverse and Descending Colon.

The left of the transverse colon and the descending colon are mainly conducting tubes of an almost solid material. Like the gullet proper, the first symptom is the result of the increasing difficulty in the passage of its contents, hence increasing

constipation. As the descending colon and the splenic flexure are fixed, any attempt at distension pulls on the neighbouring parietal peritoneum, giving rise to localised pain in carcinoma of these areas. Localised pain is common in growths of the colon devoid of mesentery. Growths in the middle of the transverse colon, by reason of their nearness to the anterior abdominal, are frequently palpable. In seven cases of growth in the transverse colon, a tumour was palpable in five. In the later stages these growths invade the stomach. This occurred in fifty per cent. of Raiford's cases. Sooner or later a solid piece of fæces blocks the lumen of the malignant stricture, and acute intestinal obstruction has set in.

It is well to bear in mind that in obstructions low down in the bowel, vomiting is a late symptom, just as vomiting is an early symptom and constipation a late symptom in a high obstruction.

Carcinoma of the Pelvic Colon (R.V. Hospital).

There were sixty-eight cases of carcinoma of the pelvic colon. Thirty-four of these were considered capable of resection, i.e., 50 per cent. Of these thirty-four, eleven died as the result of the operation, i.e., 32.3 per cent. Of eleven who survived operation more than five years ago, five are still alive, i.e., 45.5 per cent.

Five-year survival in the Mayo Clinic, 47.7 per cent.

When a stenotic stricture is present, then constipation is marked and only interposed with attacks of diarrhœa. This diarrhœa is composed mostly of mucus and blood, and is liable to come on with a peristaltic rush after a meal. It is due to the distension affecting the circulation of the mucosa and producing ulceration, to the discharges of an ulcerating tumour, and to the irritation of pent-up fæces. The frequent motions of a lesion on the right side are composed of loose watery fæces, that on the left side of small motions of mucus and blood. Constipation and diarrhœa in a colonic growth almost diagnoses a funeral.

Silent Growths.

Although the physician may recognise these early disturbances of the digestive tract that are pointers to a dreaded carcinoma of the gut, the discomfort is so little to the patient that he is frequently unaware of what it portends. It is only when the more severe symptoms of acute intestinal obstruction are present that he visits his medical adviser. This occurred in over one-third of the cases admitted to the Royal Victoria Hospital. These silent growths are more frequently found on the left side.

In series A in this investigation, 34.4 per cent. of patients were admitted in the late stage of acute intestinal obstruction. These obstructive cases are practically all C stage cases, and the operative mortality-rate would be expected to be high and the ultimate outlook poor.

The Higher the Operability Rate, the Lower the Operative Mortality (Gabriel).

	Per cent.
A cases	0
B cases	3.8
C cases	13.0

PERCENTAGE OF THREE-YEAR CURES.

A cases	86.0
B cases	73.0
C cases	19.0

As the years progress the discrepancy between the A, B, and C cases becomes more marked.

The following tables give the number obstructed in other centres, and the ultimate history of the obstructed cases in the Royal Victoria Hospital :—

ACUTE INTESTINAL OBSTRUCTION AND CARCINOMA OF THE COLON.

Name.	Number of cases.	Number obstructed.	Per cent. obstructed.
Burgess	485	173	36.6
Brown	171	43	25.7
Petren	50	21	42.0
R.V.H., Belfast ...	87	30	34.4

ROYAL VICTORIA HOSPITAL, BELFAST.

Obstructed cases.	Died in Hospital.	Resected.	Died from operation.	Lived more than 3 years.	Lived 5 years.
30	14	17	6	3	5

OPERATION.

Colostomy followed by resection	Died	Alive over 5 years
4	2	2
Cæcostomy followed by resection	Died	Alive over 5 years
10	4	3

The mortality of acute intestinal obstruction, excluding herniæ and acute intussuception, is 40.1 per cent. (Burgess).

PELVI-RECTAL JUNCTION.

The symptoms of carcinoma of the pelvi-rectal junction are essentially those due to obstruction. Again it shows itself by increasing constipation and lower abdominal pain, later with ulceration and contracture, blood and mucus are poured out and we get bouts of spurious diarrhœa. At times small pellets of fæces get squeezed past the obstruction and the patient passes small motions several times in the day, but feels he is not emptying his bowel properly. These patients, on account of passing a small motion at least once a day, will frequently deny constipation.

AMPULLA OF RECTUM.

In the rectal ampulla the symptoms are again interference with the filling mechanism of a storage chamber. At first the growth and its tendency to cause emptying may pass unnoticed, unless it bleeds. Later, as it enlarges, the patient feels that he has to pass a motion, but passes little. At a little later stage the mass by its presence causes a constant desire to empty the rectum.

Carcinoma of the Anal Canal

Pipe-stem stools are only likely to occur when the anal canal is narrowed. These patients first notice pain on defæcation. These anal growths are usually implanted on an unhealthy canal, one that has been the site of a chronic sinus, a fissure, or prolapsed piles. These patients think they are only suffering from a prolonged attack of their old enemy. Inspection will show the growth.

Cæcal Pain in Carcinoma of the Distal Colon.

In obstruction of the colon with a functioning ileo-cæcal valve, pressure is transmitted back to the cæcum. The cæcum, having the larger diameter, has the greatest pressure on its walls. As these walls distend, the patient may complain of pain in the right iliac fossa. Patients have been operated upon for acute appendicitis who had in effect a constricting carcinoma of the left side of the colon.

Acute Perforation.

Sometimes acute perforation takes place in cases of colonic new growths. This occurred in 12 out of 205 this series, i.e., 6 per cent. The perforations occur proximal to the growth, the result of internal pressure; or at the seat of growth, following upon local necrosis(70 per cent. in this series). Pressure perforations occur at the cæcal area and occasionally, in pelvic colon obstructions, in the descending colon. In these latter cases there is evidently some kinking at the splenic flexure, and the distension of the colon is localised to the left side. It has been shown experimentally that if the intraluminal pressure is above 15 mm. of Hg, circulation in the capillaries is stopped and necrosis follows : hence one cause of stecoral ulcers, which is a ready site for a perforation. These perforations, therefore, occur on the least vascular part of the gut wall, i.e., the anterior wall of the cæcum. A perforation due to local necrosis may be precipitated by the surgeon handling a growth during an exploratory laparotomy.

On making a diagnosis, we have first the symptoms described which arouse suspicions of a new growth. Abdominal palpation will usually detect a growth in the transverse colon or in the cæcum.

As before stated, palpation under anæsthesia is advisable in many cases. Rectal examination will reveal growths in the rectum and pelvi-rectal junction. If the patient is made to squat on the examining finger and to strain as at stool, a high growth may be detected not felt on the usual rectal examination.

Bimanual palpation is sometimes useful in demonstrating lumps in the pelvis.

X-Ray Examination.

X-ray examination is our greatest help in diagnosis. A "straight X-ray" in the standing position will at times demonstrate a loop distended with air or a fluid level. A barium meal can only be ordered if there is no suspicion of obstruction, as it has, on occasion, precipitated an attack of acute intestinal obstruction. The barium enema is our best ally. It must be remembered that X-ray is only a superimposition of shadows, and a defect due to a growth may be overshadowed. The

filling of the colon with air after evacuation of the barium may show an otherwise hidden growth. Parts of the flexures are superimposed, and an oblique view is advisable, but this necessitates a very heavy exposure. In this series, X-ray gave negative evidence in 15.6 per cent. of cases, and placed the growth in sites removed from the seat of disease in 18.8 per cent., so that the growth remained undetected in 34.4 per cent. It would appear that sometimes growth in one part gives rise to continued spasm in another. X-ray examination has its limitations, and too great a burden should not be placed on the radiologist.

Sigmoidoscopic.

Sigmoidoscopic examination is another help. It may show the growth or one of the surrounding papilloma. It may demonstrate blood coming from higher up the colon. Unfortunately, due to the variations in the fixation of the pelvic colon, it is sometimes impossible to pass a sigmoidoscope up the full thirty cms.

Biopsy.

Whenever possible, a piece of the suspected tissue should be removed with the Bruning's forceps.

Occult Blood.

In a suspect case the test for occult blood should not be omitted. Hurst says that it is present in all cases. In one of the cases cited the test was negative. So, considering the small number on which this examination was carried out, one should conclude that absence of occult blood does not rule out the possibility of carcinoma of the colon.

Test Meal.

Test meals are of little help. Achlorhydria is common in carcinoma of the colon, but in the series examined, normal acid curves were obtained as well as abnormal ones. Our figures are too few to quote for statistics or on which to draw conclusions, as test meals were only done in rare cases.

Laparotomy.

In cases in which there is doubt, a laparotomy should be advised, before the patient is labelled. A growth detected at laparotomy should be handled as little and as gently as possible.

Differential Diagnosis.

It is not my intention to discuss in detail the differential diagnosis of carcinoma of the colon. All causes of flatulent indigestion must be borne in mind and the case investigated accordingly. In the case of blood in the stools, all lesions, from an ulcer in the stomach to a scratch in the anal canal, must be considered. If in doubt as to whether the bleeding is from the rectum or from higher up the colon, the sigmoidoscope is helpful. As a rule, the darker the blood, the higher up is its origin. A tumour due to a localised diverticultis with surrounding fibrosis may be exceedingly difficult to differentiate from carcinoma. Early fixation is more common in diverticulitis, and blood in the stools is uncommon. The middle-aged,

healthy-looking, and probably stoutish patient is a likely subject for diverticulitis. A sigmoidoscopic examination may solve the riddle; an ulcer or papilloma are almost indicative of carcinoma, and a piece should be removed for microscopical examination. The difficulties in diagnosis can be guessed when out of eight cases that were diagnosed as inoperable at laparotomy, four are still alive and well more than five years afterwards. One of these, the only one investigated, showed well-marked diverticulæ on examination by a barium enema. In ulcerative colitis the stools are characteristic and the sigmoidoscope is again of help. If, in spite of these examinations, there is still doubt, a barium enema should be given, which will show the characteristic picture of ulcerative colitis. Other tumours, as secondary deposits from a distal growth and uterine endometriomata, may stimulate a carcinoma in the rectum, but these tumours leave the mucous membrane for long unulcerated, and in uterine endometriomata one may see the characteristic dark cystlike areas with the sigmoidoscope or proctoscope that are diagnostic. Chronic inflammatory conditions as tubercle and actinomycosis in the cæcal area may suggest a carcinoma of the cæcum. Syphilis may simulate a growth in any part. Dolichocolon may simulate carcinoma by attacks of pain, vomiting, and constipation, as well as by the passage of blood. This complaint is, however, of long standing, and the barium enema helps to distinguish between it and carcinoma. If in serious doubt, it is wiser to explore the abdomen at operation. Two conditions may co-exist.

Treatment.

With our present knowledge, the operative removal of the growth, when it is still localised, is the most dependable method of cure. The late results of removal of growths are very encouraging, more so than in most other regions. It would appear from our results, as before stated, that the lesion is for long a local one, and as such gives great encouragement to the surgeon. As an offset to this, these growths are so often late in being submitted to operation, that our hope of complete cure is small and the risks of operative removal are correspondingly increased. In late growths the operative mortality in both palliative operations and those in which a cure is attempted by removal is exceptionally high.

Operability Rate, R.V. Hospital, Belfast.

Carcinoma of the Rectum.

Out of 132 cases, 93 were unfit for resection, i.e., 29.5 per cent. only were fit for resection. The majority of these were in the C stage.

Carcinoma of the Colon.

Out of 205 cases, 99 were unfit for resection, i.e., about 50 per cent.

Other Centres' Operability Rate.

New York	Colon	63.5
London	Rectum	54.0
Belfast	Rectum	29.0
Do.	Colon	50.0

OPERATIVE MORTALITY.

	Per cent.
Wilkie	15
Australian Hospitals—	
Distal Colon	31
Proximal colon	41
Rankin (Mayo Clinic)	9.6
Gordon Watson	17.7
Cheever	17.6
Saltstein and Sandweiss—	
Distal colon	57.0
Proximal colon	39.0
Raiford (resections)	27.4
R.V. Hospital, Belfast (resections)	39.5

It behoves the surgeon, then, to take extra precautions in dealing with these very ill patients. If the patient has been vomiting from acute obstruction, his fluids are depleted and the toxins in his blood are much increased, as shown by the high blood urea so frequently noted. Hence transfusions by intravenous drip method or by periodic mass transfusions are indicated. After introducing warm olive oil into the rectum, an attempt should be made by enemas to relieve the acute obstruction, remembering that a hard pellet of fæcas has probably caused the block. There is nothing to be gained by postponing the relief of an obstruction by colostomy. In cases not obstructed, a period of treatment with saline aperients should be undertaken before any operation. During this period the patient's general health should be built up, his hæmoglobin brought up to normal, his blood-urea level lowered by copious drinking of fluids, his blood-pressure level estimated and corrected as well as possible, and vitamins given to make up for loss of vegetables and to increase resistance. A man should also be trained to use the urinal when lying in bed. An associated enlarged prostate should be dealt with beforehand. In some patients, dilute hydrochloric acid seems helpful. Kaylene and liquid paraffin are also useful. When the tongue is moist and clean and hæmoglobin is sixty per cent. or above, operation may be undertaken. Wilkie recommends a vaccine of streptococci and B. coli given on the eighth and third day preceding operation. Rankin does not place such emphasis on his intra-peritoneal vaccine now, as he did formerly.

In performing a laparatomy to determine the operability of a growth, a para-median incision should not be used, if it is intended to use a paramedian incision on the opposite side some weeks later for the removal of the growth. These com-bined incisions will cut off the blood supply of the linea alba, and sloughing is the result. Some cases of pyelophlebitis are undoubtedly due to this, the infection passing by the ligamentum teres to the liver. The growth should not be handled, as this makes for the spread of infection and has hastened a perforation at the site of the growth.

Spinal anæsthesia, helped, if necessary, by local infiltration of the abdominal wall and with or without gas and oxygen, is to my mind the anæsthetic of choice in these patients.

Colostomies have a surprisingly high mortality. Raiford, in his series, reports a mortality of forty-four per cent. in cases too far advanced for resection in whom a colostomy was performed. In this series the mortality for like cases was forty-six per cent., but inclusion of those colostomies in whom resection was ultimately performed reduces the mortality to thirty-seven per cent. In forty-seven cæcostomies there were ten deaths, giving a mortality of twenty-one per cent. for simple cæcostomy.

It is my impression that the mortality for colostomy would be lower if patients had not to wait some days before the colostomy is opened. These patients are suffering from an acute retention in the intestinal tract with toxic absorption, and the sooner relief is afforded the better.

There is little chance of abdominal-wall infection if the following precautions are taken :—The wound is tightly sewn around the delivered portion of gut, the wound well vaselined, a piece of glove rubber about four or five inches in diameter is taken which has a hole which will just take one's thumb; this hole is stretched so that the protruding gut and its supporting glass rod is manipulated through it. The rubber is then spread over the wound as a protection and it fits so snugly around the gut that there is little chance of leakage from the open gut to the wound. A rubber tube is placed in the gut and fixed by a purse string. About half a pint of warm olive oil is run in and allowed to remain for a few hours. If necessary the gut can be opened thoroughly in eight to ten hours. If the colostomy is placed in the right half of the transverse colon, it does not complicate an operation on the left colon.

A cæcostomy is a very inefficient method of relieving an intestinal obstruction; it may not be any easier to perform than a colostomy, and it does not drain the gut; it is only a type of overflow and safety-valve. I have watched a patient on whom a cæcostomy was performed for an acute obstruction in the pelvic colon, grow weaker and weaker as the days passed, till he was unable to sit up without support. A colostomy was then performed, and he rapidly gained so much strength that he was able to go back to his business an apparently healthy man for eighteen months, before he finally faded away with his disease.

In this series, colostomy and resection had a lower death-rate than cæcostomy and resection, but the cases are too few for one to draw definite conclusions.

Operation	Number	Deaths	Mortality per cent.
Cæcostomy followed by resection ...	30	11	37
Colostomy followed by resection ...	6	2	33

The mortality of primary resections of colonic growths is exceptionally high. In this series there were thirty-seven primary resections, with eighteen deaths, giving a mortality of forty-nine per cent. Practically every other patient died. In the cases that came to post-mortem, peritonitis was the chief cause of death. It

would seem from these results that a two-staged operation is to be desired, unless a type of Paul's operation is performed. In this series this latter operation gave the best immediate results and the best late results. Unfortunately, the operation is practically restricted to growths in the pelvic loop, where the long mesentery allows the glands to be removed with the growth. Local recurrence is said to be common in this operation. It occurred in one case out of six in series A, but in twelve operations there were only two deaths, giving an operative mortality of seventeen per cent. and a five-year cure of sixty-seven per cent. Recurrence in the abdominal wall in Paul's operation is generally placed at ten per cent.

A preliminary colostomy has the advantage of draining the bowel and allowing the atonic poisoned gut walls to recover. Also, when the resection is completed, the site of the anastomosis is not subject to the same strain of distending gases and the passage of fæcal contents. Thus a weak area in the anastomosis is not so likely to lead to disaster. It is well to make sure that the anastomosis is completely healed and that there is no stricture at the anastomosis, before the colostomy is closed. In one case in the series of hospital cases, death was due to the anastomosis giving way at the suture line following the closure of the colostomy. There is no urgency to close a colostomy, as it serves as a safety-valve should local recurrence take place.

Devine cuts off the fæces from the distal part of the colon in his type of colostomy. He then washes through the distal part with antiseptic solution till he considers that this part is sterile. Only then are resection and anastomosis undertaken. I do not think that with an ulcerated growth, sterility is obtained, but the gut is comparatively clean and its walls have regained their healthy tone with good circulation. I think one of my personal cases would have died had he not had a Devine's colostomy. As it was, he only developed a localised abscess, which recovered with free drainage. When an anastomosis is performed in a non-functioning colon, as after a Devine's colostomy, it is essential to see that the agglutinated walls of the crushed ends of the gut are forced open; for there is now no passage of contents to perform this function, as is expected in most modern methods of axial anastomosis. In axial anastomosis I have found the Furniss clamp a useful asset.

In growths low in the pelvic colon, where there is hesitation between attempting an axial union and doing an abdominal perineal resection, the use of Rankin's method of mobilising the floor of the pelvis will frequently save the situation, and allow of axial union. In one case in which I made use of this method, the patient was having normal bowel actions on the fifth day.

In the right side of the colon, end-to-side anastomosis, after Rankin, is preferable to a lateral anastomosis, as the latter type does not completely divert the intestinal contents. At a later operation the right colon and terminal ileum are removed. In severe or complete obstruction of the ascending colon or hepatic flexure, it is necessary to combine this anastomosis with a cæcostomy, as with a competent ileo-cæcal valve, the part between this and the growth is a closed sac and bound to perforate. This occurred in one of the hospital series.

In any anastomosis the gut should be clean and the blood supply should be beyond reproach. Too meticulous care in cleaning away appendices epiploicæ may injure the long arteriole to the anti-mesenteric border. There should be no tension in or within the line of suture.

Shock, the second main cause of death, can be reduced to a minimum by careful pre-operative attention, seeing that the patient is in a desirable condition for operation, spinal anæsthesia, gentle handling, a minimum of loss of blood, and finally gentleness in moving the patient. Douglas Miller has shown by series of blood-pressure records how a patient is shocked by even small changes in position during and at the end of an operation (fig. 3). It is advisable in low colonic growths to sigmoidoscope the patient after an interval. I have in one case detected a small wart just below the anastomosis which was readily destroyed by diathermy in a case where a colonic growth had been successfully resected.

It is difficult to know when to count a patient as cured. These patients are frequently near the end of their allotted span, and if we can prolong their life till its normal decline we should count it as a success. One patient in this series had a small growth removed by a local operation, and came back twenty years later with an inoperable growth in the same site. We have no record of the pathology of the original tumour. Another patient who had a successful resection of the rectum carried out was recorded as having died ten years later from carcinoma of the uterus. This may have been a new growth or it is possible it was a late recurrence of the former rectal carcinoma. Colostomies performed for malignant disease of the colon have been recorded as having lived for five to six years with the growth untouched. However, Rankin's figures seem to show that where the growth has been resected death from recurrence after five years is rare.

Case of Colostomy.

Patients should realise that a colostomy is not a severe handicap. Many professional men have had colostomies for years without their clients being aware of their abnormal opening. The patient should be taught to regulate his colostomy by diet or he can give himself a washout each morning. The colostomy belt is unnecessary, and is dirty and likely to encourage prolapse. A pad of wool with a broad belt protected with a piece of macintosh is all that is required.

R.V. Hospital, Belfast, 1925-1937.
Operations Performed and Mortality.

Description	Number	Deaths	Mortality %		Cures
Cæcostomies	47	10	21.3		0
Colostomies	30	11	36.2		0
Colostomy fold by resection ...	6	2	33.3	2/5	40.0
Cæcostomy fold by resection...	30	11	36.2	2/15	13.0
Primary resections ...	37	18	48.7	6/16	37.8
Paul's resection	12	2	16.7	4/6	66.6

ALL RESECTIONS (FIRST SERIES), 1925-1932.

Operations	41
Died	15
Recovered	26
Lived over 5 years	13

This gives an operative mortality of 39.5 per cent.; but a five-year cure for those that survive operation of fifty per cent.

CARCINOMA OF THE COLON.

SERIES A (OPERATED UPON MORE THAN 5 YEARS).

R.V. HOSPITAL, BELFAST.

Site	Number	Alive
Cæcum	10	3
Ascending colon	4	0
Hepatic flexure	6	1
Transverse colon	2	1
Splenic flexure	8	1
Descending colon	12	1
Iliac colon	6	1
Pelvic colon	31	5
Pelvi-rectal	8	0
	—	—
Total	87	13

i.e., 15% cured.

One case of pelvic colon growth lived over three years after resection; cause of death stated to be cerebral hæmorrhage. Another case died over four years after resection from a perforation proximal to the anastomosis (Paul's operation).

All cases traced except two, who have not been certified as dead in Northern Ireland.

RADIUM AND CARCINOMA OF THE LARGE BOWEL.

In this series there were fifteen cases treated with radium, and all these cases were too advanced for other operative treatment.

Of the fifteen cases, two lived over three years, one lived over two years, four lived over one year, eight lived less than one year.

In a discussion in the Royal Society of Medicine in 1935, Sir Charles Gordon Watson states that he has less recourse to radium than he had before 1931.

There were 149 cases treated with radium. These included:

A—Operable cases who refused surgical operation.

B—Selected inoperable cases.

C—Radium preliminary to excision.

D—Limited perineal recurrence.

He had apparently complete cure in six cases which had been considered inoperable, time of observation ranging from 4½ years to 7½ years.

Disadvantages of Radium in Treatment.

1. Fibrous stricture.
2. An excision may be made more difficult due to fibrosis.

Radium and Pain.

3. Pain may be increased if an overdose has been administered or it may be increased if there is an ineffectual attack on the growth.
4. Radium should not be used in the presence of sepsis.

Advantages.

1. Occasionally a fixed inoperable growth may be rendered operable.
2. Life may be prolonged in inoperable cases, as shown by S. Cade.

Stanford Cade has treated sixty-nine cases of inoperable carcinoma of the large bowel. Of five treated seven years, one is alive; of seventeen treated six years, eight are alive. Some still show evidence of disease.

The Radium Institute of Paris considers that as a rule the malignant tumours of the large intestine are radioinsensitive, that rarely one may find a tumour composed of immature cells, and these are radiosensitive.

In epithelioma of the anus, where the growth originates in the skin epithelium and is not a downgrowth from the bowel, a colostomy followed by radium is the method of choice. Where the carcinoma is a downgrowth originating in the mucous membrane, radium has been disappointing.

Surgery meets with its greatest difficulties in carcinoma of the large bowel. First, a patient with the chronic lesions of advanced years, poor arteries, poor renal function, poor lung æration, and poisoned with the contents of a chronically obstructed gut; second, a field of operation drenched with virulent micro-organisms; third, devitalised tissues on which to work. Yet in this unpromising field the surgeon may work buoyed up with hope. The disease is of low malignancy, and more five-year cures can be claimed than in any other field of surgery dealing with malignancy.

Rankin reports over fifty per cent. of his patients as five-year cures. If we can get the patient in an earlier stage of the disease and lower the operative mortality, there is no reason why these figures may not be surpassed.

Before concluding this paper I should like to express my thanks to the honorary surgical staff of the Royal Victoria Hospital for permission to study their case sheets, from which my statistics are drawn; and to the hon. radiologist of the Ulster Hospital for his co-operation in studying the function of the colon.

Fig. 1—Carcinoma of the cæcum, showing the proliferation found here.

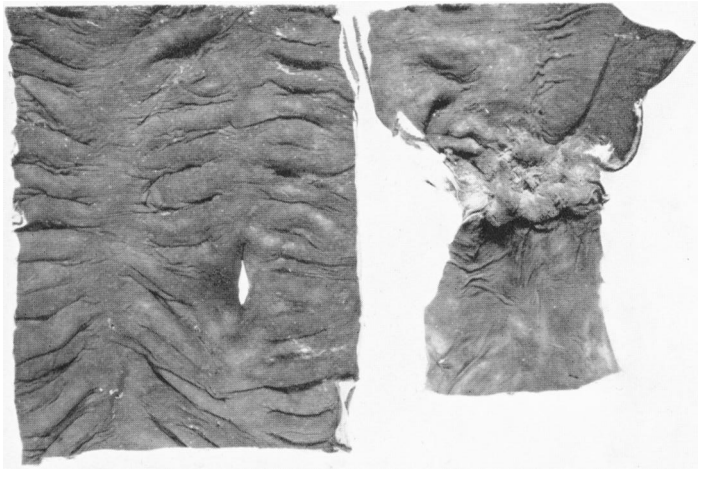
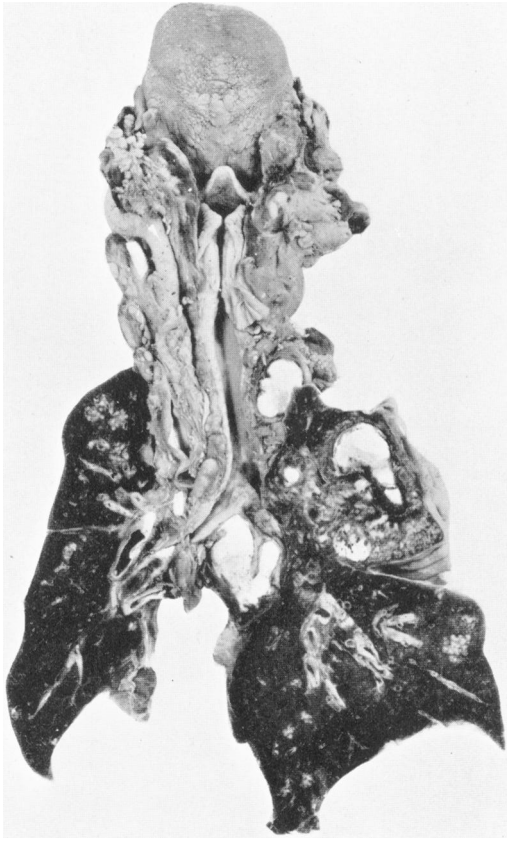
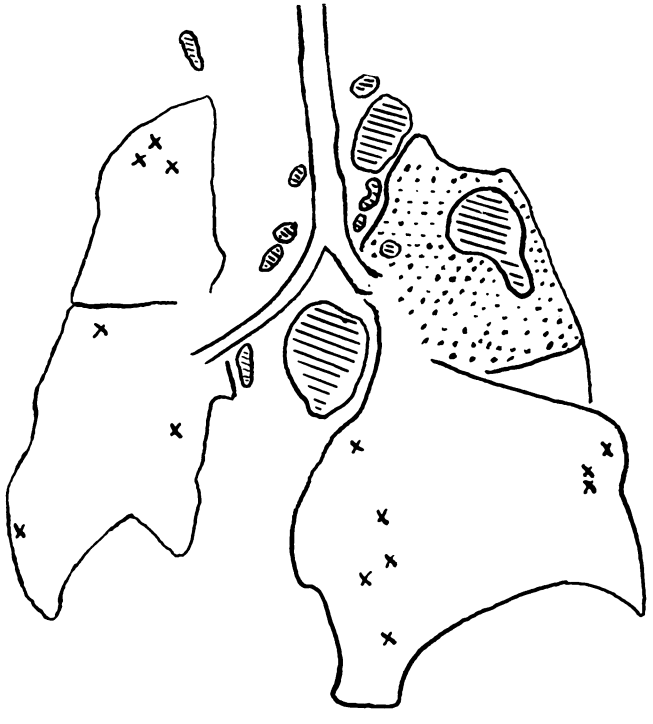


Fig. 2—Carcinoma of the pelvic colon, showing the construction, sterculous ulceration proximal to the growth, and a proximal perforation.





Shaded areas represent the primary lung focus and caseous regional lymph-nodes.

Stippled area represents the consolidation and collapse in the right upper lobe.

Areas marked "X" represent patches of tuberculous broncho-pneumonia.